

SENSORY INFORMATION FROM AFFERENT NEURONS

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PROGRESS REPORT #11

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Progress in the Eleventh Period

During the present reporting period we implanted devices in two additional animals (NIH 34, 35) for a total of five animals in a current series designed to test the long-term viability and selectivity of 8-channel Multi-Contact Cuff (MCC) electrode arrays installed on the Sciatic nerve above the knee. Each subject received four single-channel tripolar nerve cuffs, one on the sciatic nerve proximal to the hip joint and three on the tibial, superficial peroneal and sural nerve branches of the sciatic. Cuff dimensions were as in Table 1 of a previous QPR (#9). Each subject was also implanted with EMG electrodes on 6 innervated muscles (Table 1, QPR #9).

The stability of the implanted devices was tested the night after implant and once or twice again in the following two weeks. As for the previous subjects of this series, our protocol specified the implant of an 8-channel MCC and an additional EMG electrode (MG muscle) in a second surgery, 2-3 weeks following the first one. This protocol provides baseline data on nerve status and implant stability prior to installation of the MCCs, in order that any changes that may follow the MCC implantation can be clearly observed and further tracked over the following six months of the experiment.

To this date, all five subjects have exhibited essentially similar, gradually evolving, modest changes in the amplitude and latency of the compound action potentials (CAPs) recorded from the MCC and from the proximal Sciatic cuff when the distal sites were stimulated under anesthesia, comparable to data from NIH 30 shown in Fig. 1 of our previous QPR #10. This indicates that all the implanted nerves continue to be in good condition.

There have been occasional wire breakages from the proximal sciatic nerve cuff, however, that necessitated the replacement of this cuff in a subsequent surgery. When this was done, the amplitude and latency of the CAPs recorded from the MCC and from the new proximal Sciatic cuff were essentially similar to earlier values obtained when the original cuff was still functional, indicating that the condition of the nerve was not affected by the cuff replacement.

Plans for the Twelvth Period

We will continue to monitor the status of the implanted devices and performance under anesthesia and during walking, as well as analyze the selectivity of aspects of the MCC.

Publications Resulting from this Research

Strange, K. and Hoffer, J.A. Gait phase information provided by sensory nerve activity during walking: Applicability as state controller feedback for FES.
IEEE Trans. Biomed. Engineering 46:797-809, 1999.